CDC

MANUAL 5

SELF-STUDY COURSE 3030-G

Principles of Epidemiology

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

SELF-STUDY

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DISEASE SURVEILLANCE

INTRODUCTION

"Surveillance" as used in this guide, refers to the continued vigil over the occurrence and distribution of disease and events or conditions which increase the risk of disease transmission. Surveillance is a continuous and systematic process consisting of four major functions: collection of relevant data for a specified population and geographic area; consolidation (collation) of the data into meaningful arrangements; analysis (interpretation) of the data; and regular dissemination of data and interpretations to those in disease control programs.

There are 10 major sources or kinds of data relevant to disease surveillance. They are:

1. mortality reports
2. morbidity reports
3. epidemic reports
4. reports of laboratory utilization
5. reports of individual case investigations
6. reports of epidemic investigations
7. special surveys (e.g., of hospital admissions, disease registers, serologic surveys)
8. information on animal reservoirs and vectors
9. demographic data, and
10. environmental data

The ultimate objective of disease surveillance is to determine the extent of infections and the risk of disease transmission so control measures can be applied effectively and efficiently. Surveillance data must, therefore, be current and complete to disclose the occurrence and distribution of disease. Disease surveillance is sometimes conducted even when control measures are not yet available--in anticipation of their development. There are two principal reasons for conducting surveillance under such circumstances. The first is to increase knowledge of the reservoir and the modes of transmission so priorities can be established when control does become possible. The second is to assess the effect of control measures when they become available and are implemented.

The achievement of the ultimate objective requires that certain subobjectives be met by the persons who are responsible for disease surveillance programs. These persons must:

1. Describe each person having an infection--by name, address, age, sex, race, occupation and the date of onset of symptom--as soon as possible after exposure.

2. Determine the source of infection and the mode of transmission of the infection in each individual case.

   a. Possible sources--man, animal, or environment
   b. Possible modes of transmission--direct or indirect

3. Identify exposed susceptibles to whom the infection may have been transmitted.

4. Specify frequency of occurrence of infection in population groups at risk by:

   a. Time--Frequency of occurrence by unit of time (year, month, week, day, hour)
   b. Place--Frequency of occurrence according to defined spaces (residence, place of work, socioeconomic area, school, hospital, etc.)
   c. Person--Frequency of occurrence according to specified attributes (age, sex, race, occupation, immunization status, etc.)

5. Identify as in "4," populations that are experiencing, or that might experience, increased frequency of infection.

6. Prepare and distribute surveillance reports to persons participating in disease prevention and control activities.

These objectives concern human populations, but because of the importance of animals in the transmission of many diseases of human interest, similar objectives for the surveillance of diseases of animals (zoonoses) are equally appropriate. The data collected in zoonoses surveillance programs serves the same purposes as human disease surveillance data and focuses on the description of infected animals in terms of the time, place, and manner in which they become infected.

The accomplishment of these objectives requires constant and diligent performance of a variety of epidemiologic tasks. These tasks are fully discussed in the following text and are listed in outline form in Appendix A.

LEGAL BASIS FOR MORBIDITY REPORTING

Each state's morbidity reporting system is based upon regulations adopted by the state board of health, which derives its authority to issue regulations from acts of the state legislature. In some states the legislative act defines most, if not all, of the reporting requirements; and changing these requirements would necessitate another act of the legislature. More commonly, enabling legislation confers upon the state board of health the authority to establish and modify the morbidity reporting requirements. These reports, originating primarily from physicians, are usually considered confidential and are not available for public inspection in the absence of demonstrably valid and acceptable purposes.

Morbidity-reporting regulations characteristically specify which diseases or conditions are reportable, who is responsible for reporting, what information is required for each case of disease reported, what manner of reporting is needed, and to whom the information is reported. They also specify various protective measures to be taken in the event of the occurrence of specified diseases. These features are discussed more fully below.

In addition to specific diseases or conditions which have been established as reportable within a given state, health department regulations commonly specify two other circumstances that require reporting: the occurrence of any outbreak or unusually high prevalence of any disease and the occurrence of any unusual disease of epidemiologic importance. Provision is made also in most regulations to add immediately to the list of reportable diseases any disease that becomes important from the public health standpoint. The specific information required for each case of a reportable disease can usually be revised under the same kinds of circumstances.

Reporting known or suspected cases of a reportable disease is generally considered to be an obligation of the following persons:

Physicians, dentists, nurses, other health practitioners, and medical examiners

Administrators of hospitals, clinics, nursing homes, schools, and nurseries

Any other individuals knowing of, or suspecting, the existence of a reportable disease.

Laboratory directors are commonly required to report the results of diagnostic tests which yield evidence of a reportable disease (i.e., isolations and identifications of infectious agents, elevated serologic titers, etc). These reports are not considered to be substitutes for physicians' morbidity reports.

The information recommended by the Center for Disease Control to be obtained for each case of most reportable diseases includes the patient's name, age, sex, race, address, name of patient's head-of-household, the name of the person reporting, and the dates of onset and of the report (Appendix B). The place and date of hospitalization (if hospitalized) are also commonly requested. For syphilis and tuberculosis more detailed information regarding the diagnosis is required.

The particular requirements for the reporting of a specific disease depend largely on the priority assigned to the disease by the health department. Venereal diseases and tuberculosis are examples of high-priority diseases. In most states, they are to be reported as soon as they are diagnosed, using report forms different from those routinely used for other reportable diseases. Also, the reports of high-priority diseases are often sent not to the local or state epidemiologist, but to the local or state director of the respective disease control program.

Table 1

Reportable Diseases and Conditions

A. Diseases reportable in most states:

**Amebiasis
Anthrax
Aseptic meningitis
Botulism
Brucellosis
Chickenpox
*Cholera
Diphtheria
Encephalitis, primary infectious
Encephalitis, post-infectious
**Food-poisoning (outbreaks)
Hepatitis-A
Hepatitis-B
Leprosy
Leptospirosis
Malaria
Meningococcal infections
Mumps
**Pertussis
*Plague
Poliomyelitis, total and paralytic
Psittacosis - Ornithosis
Rabies in man and animals
Rubella
Rubella congenital syndrome
Salmonellosis, excluding typhoid fever
Shigellosis
*Smallpox
Tetanus
Trichinosis
Tuberculosis (new active cases)
Tularemia
Typhoid fever
Typhus, fleaborne (murine)
Typhus, tickborne (Rocky mountain spotted fever)
Venereal diseases
Syphilis (primary & secondary)
Gonorrhea
** Other specified venereal diseases: chancroid, granuloma inguinale, and lymphogranuloma venereum
*Yellow fever

* - Diseases covered by International Quarantine Agreement
** - Diseases not rountinely reported to CDC on a weekly basis

Table 1

(Continued)

B. Diseases and conditions reportable in some states only:

Abortions
Adverse drug reactions
Animal bites
Cancer
Cat-scratch fever
Congenital defects
Conjunctivitis
Echinococcosis
Epilepsy
Erysipelas
Eruthema
Fungal infections
Glanders
Glomerulonephritis
Impetigo
Industrial and occupational diseases
Influenza
Keratoconjunctivitis
Lead poisoning
Listeriosis
Melioidosis
Meningitis, bacterial (except meningococcal)
Mycobacteriosis
Ophthalmia Neonatorum
Otitis media
Parasitic diseases and infestations
Pneumonia
Poisoning
Q fever
Rat-bite fever
Reye's syndrome
Rheumatic fever, acute
Rickettsialpox
Septicemia
Staphylococcal infection
Streptococcal sore throat and scarlet fever
Tickborne diseases
Toxoplasmosis
Trachoma
Vaccinia
Vincent's angina
Viral infections
Yaws

All other reportable diseases are usually reported weekly, but provision is made to report selected diseases and conditions such as botulism, quarantinable diseases, and epidemics, which pose special threats to the public, immediately by telephone or telegraph. In some states, certain reportable diseases are in some instances reported within 24 hours of the time of diagnosis, while other diseases (e.g., influenza, mumps) are reported in a summary form on a weekly basis.

In most states, health department regulations require that case reports be submitted on a standard form that they provide. However, some states are experimenting with telephonic reporting in lieu of written reports. Other states have reporting systems that call for a sample only of all practicing physicians in the state (or local area) to submit weekly written reports of selected reportable diseases they have diagnosed, while all physicians continue to be responsible for reporting only certain diseases and conditions of special importance.

Usually, case reports are sent to the local health department, which copies them or transcribes selected data, and sends the originals to the state health department at weekly intervals. If case reports are sent directly to the state health department, it is usually because there is no local health department in the reporting physician's area; or the local health department, for whatever reason, cannot effectively respond to the reports; or the state has determined that it shall be primarily responsible for responding to the reports.

At the national level, the Public Health Service has been made responsible by an act of Congress for the "collection, compilation, and publication of morbidity statistics." The scope of that responsibility--which has been delegated to the Center for Disease Control in Atlanta, Georgia--has grown considerably since its enactment in 1878.

Diseases which the states report to the Center for Disease Control are determined by the Association of State and Territorial Health Officers. A current list of these reportable diseases can be found in the Manual of Procedures for National Morbidity Reporting and Surveillance of Communicable Diseases. The information to be reported, to whom, and how are also presented in detail. Briefly, however, each state epidemiologist reports urgent situations such as the occurrence of an epidemic or of an internationally quarantinable disease, by telephone or telegraph as soon as possible. Further, he makes a weekly telegraphic report to CDC of all the nationally reportable diseases that have been reported in that state during the preceding seven days. Supplemental detailed information on all cases of selected diseases is subsequently sent to the Center.

The Center's review and analysis of the data are essentially the same as that done by local and state health departments. From the weekly summary reports received from the states and territories, the Center for Disease Control compiles and distributes the "Morbidity and Mortality Weekly Report" which is described in the section, "Health Department Surveillance Reports." From supplemental weekly, monthly, quarterly and annual reports of cases, epidemics, and isolations of etiologic agents, and reports submitted by its own investigators, the Center for Disease Control prepares and distributes detailed surveillance reports on various diseases (Appendix C).

By international agreement, the Center for Disease Control promptly reports to the World Health Organization any reported cases of the internationally quarantinable diseases--smallpox, plague, cholera, and yellow fever. CDC also reports influenza virus isolates and sends the World Health Organization an annual summary of the disease reports received during the previous year.

The practice of reporting morbidity data to successively higher levels of government not only keeps each level informed of the current incidence in its jurisdiction, but makes possible the compilation of data for successively larger areas. These compilations provide opportunities for identifying causative factors not discernible at lower levels--especially when the incidence is low in most local areas.

HEALTH DEPARTMENT PROCESSING OF PHYSICIANS' MORBIDITY REPORTS

Utilization of Morbidity Reports

Optimal utilization of physicians' case reports by the local health department requires that daily review be a routine element of the collection process, and that the data be consolidated and analyzed statistically at weekly intervals. The purpose of the daily review is to recognize cases of disease which meet criteria for investigation, and the purpose of the statistical analysis is to recognize high-risk groups (in which an outbreak may be occurring) and changes in degree of risk (trends). Surveillance data is also useful in assessing program efficiency. The value of these activities depends always upon their timeliness and upon the quantity and accuracy of the detail on each case.

If it is the state health department, instead of the local health department, which initially receives the morbidity reports from the reporting individuals in some or all parts of the state, then it should review, consolidate and analyze the reports from all of its city and county health departments. These data then become the basis for current surveillance reports for distribution within the state.

Review of Morbidity Reports

An effective review of morbidity reports requires that each case report be examined and that the information it contains be compared with criteria regarding the management of specified diseases or conditions. The single most important piece of information in the report is the diagnosis since most, if not all, health department disease control objectives and programs are disease-specific. Next in importance is the information regarding the attributes of the case (e.g., age, sex) and the time and place of its occurrence.

The principal decision to be made about each diagnosed or suspected case of disease is whether it should be investigated or not. The following criteria can be used as a basis for that decision.

1. DO SURVEILLANCE OR DISEASE CONTROL OBJECTIVES REQUIRE IT?

   If health department objectives require the investigation of particular diseases, then the receipt of a report of one of these diseases would automatically lead to an investigation (without having to consider any other criteria). This situation is exemplified by tuberculosis and syphilis. The control of each of these diseases is accomplished by a program established specifically for that purpose. An important part of such programs is the treatment of known cases and their contacts to render them non-infectious and, therefore, incapable of spreading the disease. The importance of case and contact investigation is such that program guides have been prepared which require the investigation of every reported case or suspected case of each of these diseases.

Other diseases, too, are commonly investigated every time they occur, even in the absence of a categorical program guide which requires it (see Table 2). The requirement that these diseases be investigated stems from the general objectives of the health department relating to the control of infectious diseases and recognition of their actual or potential seriousness to the public.

Table 2

Diseases Commonly Investigated Every Time They Occur:

1. animal bites
2. anthrax
3. botulism
4. brucellosis
5. cholera
6. diphtheria
7. giardiasis
8. Lassa virus infection
9. leprosy
10. malaria
11. paralytic shellfish poisoning
12. plague
13. polio
14. human rabies (and animal rabies if human exposure is suspected)
15. Shigella dysenteriae, Type 1 infection
16. syphilis
17. tetanus
18. trichinosis
19. trypanosomiasis
20. tuberculosis
21. tularemia
22. typhoid fever
23. typhus (flea-, louse-, and tickborne)
24. yellow fever

2. IS THE INFECTION UNUSUAL CONSIDERING THE TIME OR PLACE OF OCCURRENCE OR THE NUMBER OF CHARACTERISTICS OF THE PERSON(S) INVOLVED?

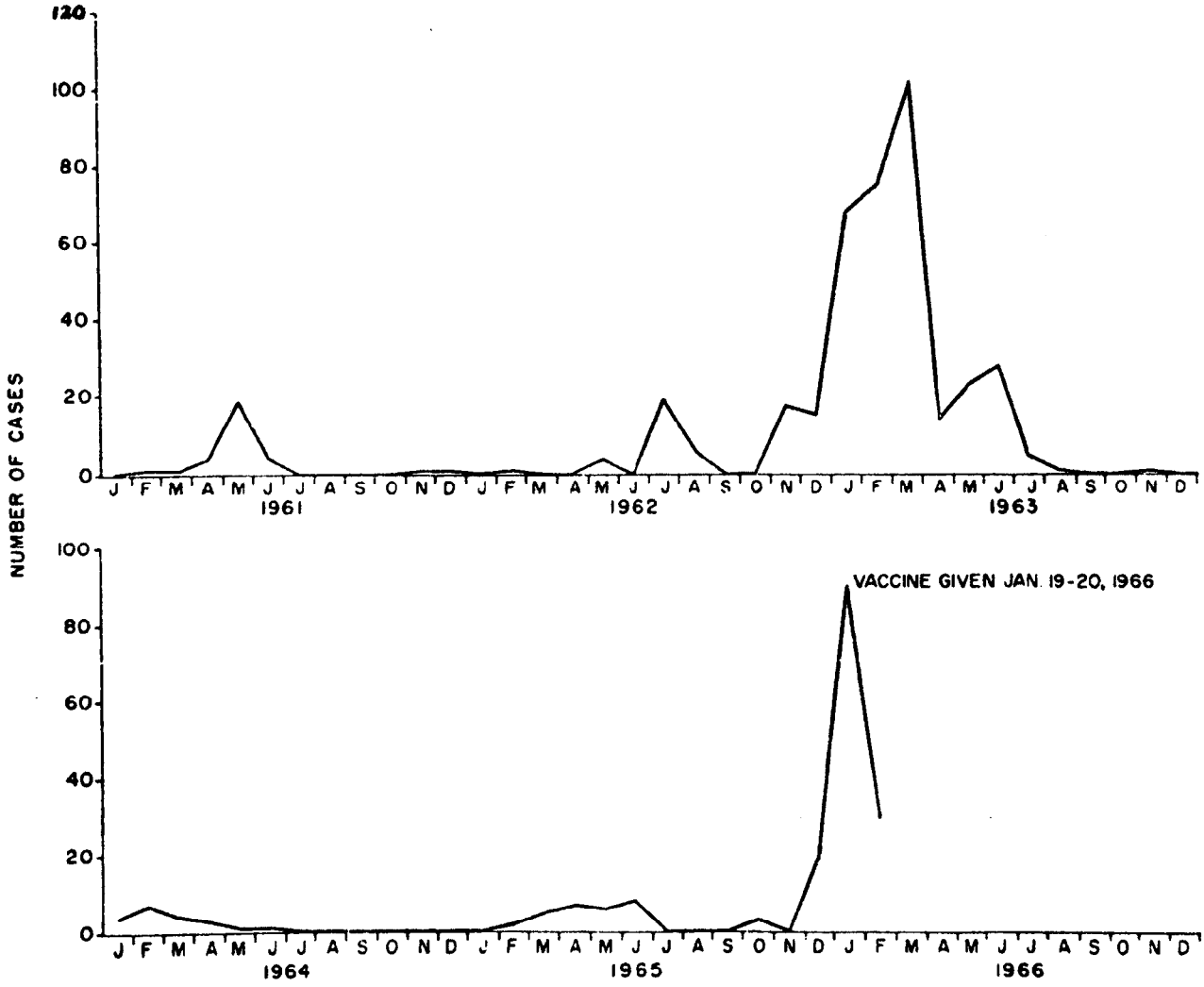
When the current incidence of a disease in a specific population at a particular time and place exceeds the usual frequency of that disease in that population, then an investigation may be indicated. Determining that the current incidence exceeds the usual incidence requires comparing--constantly--the current incidence with the incidence during previous reporting periods. The application of this method is made clear in the graph of measles in Isabella County, Michigan (Figure 1). It is evident here that large epidemics of measles occurred in two time periods: November, 1962 through June, 1963 and December, 1965 through at least February, 1966.

Figure 1

Reported Cases of Measles by Month

Isabella County, Michigan

January 1961-February 1966

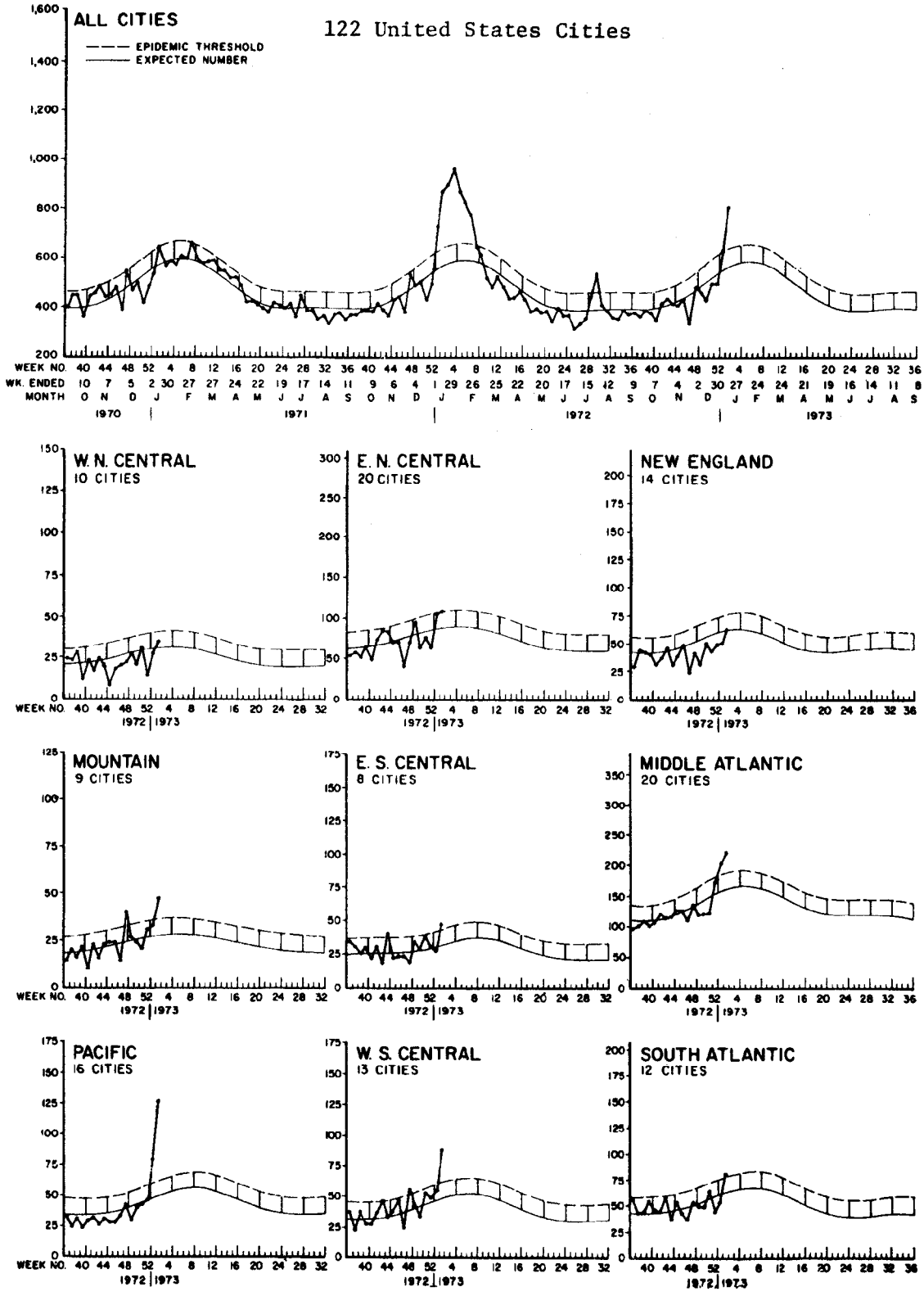


Source: Warren, Robert J., M.D., "Measles in the United States," HEW, PHS, BDPEC, Center for Disease Control, Atlanta, Georgia, February 1967, p. 4.

Figure 2

Pneumonia-Influenza Deaths in

122 United States Cities

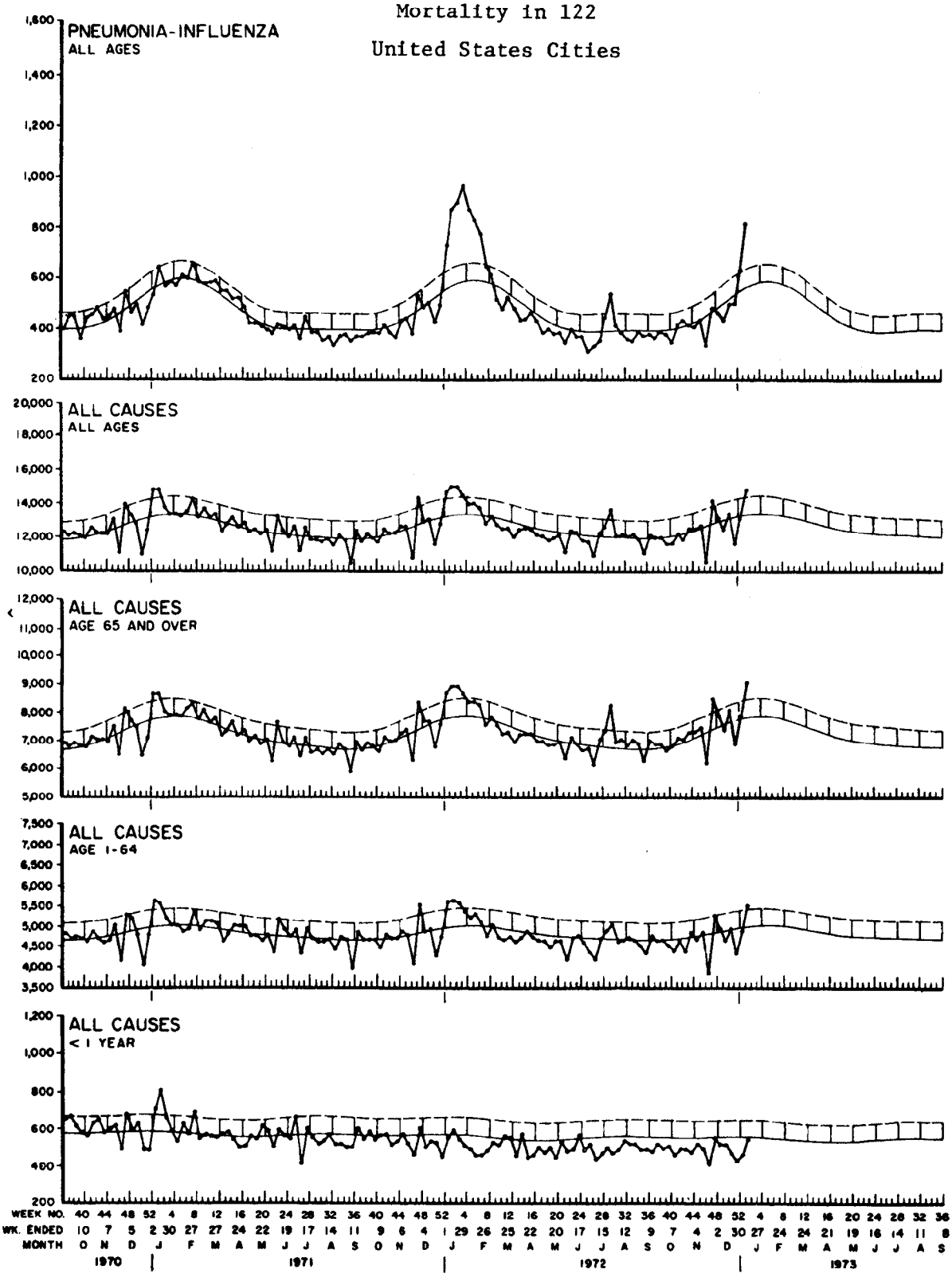


Source: Morbidity and Mortality Weekly Report, HEW, PHS, CDC, Vol. 22, No. 2., January 13, 1973, p. 11.

Figure 3

Mortality in 122

United States Cities



Source: Ibid, p. 12.

An important--and largely unresolved--question is how much of an excess is required to precipitate action on the part of the health department. One disease, or disease complex, for which this question has been answered at the national level through the establishment of threshold values is pneumonia-influenza. Following are graphs which illustrate CDC's application of a threshold to pneumonia-influenza mortality. In these graphs the thresholds are applied to the United States as a whole and to its constituent regions (Figure 2) and to selected age groups (Figure 3). The light solid line in each graph represents the "expected" mortality, and the dashed line represents the "epidemic threshold." The actual mortality is shown by the dark solid line. When the current mortality exceeds the threshold level for at least two consecutive weeks, then an epidemic is usually considered to be in progress.

More commonly, though, the amount of excess required for action is determined locally and reflects the priorities assigned to the various diseases and the interests, capabilities, and the resources of the local health department. Some diseases commonly investigated, primarily when their incidence exceeds some threshold or when a common source is suspected, are the various foodborne diseases, measles, rubella, and viral hepatitis.

3. IS A COMMON-SOURCE OUTBREAK SUSPECTED?

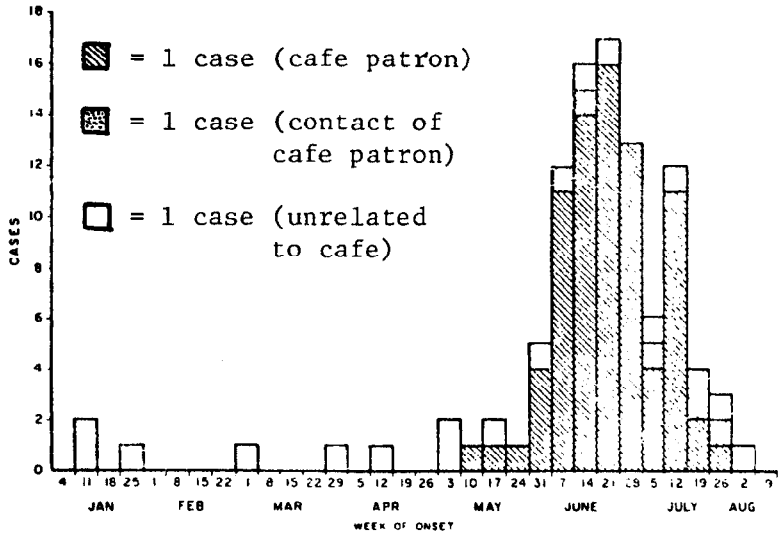
Suspicion of a common source of infection for two or more cases of disease is often sufficient reason to initiate an investigation. Such a suspicion might be aroused in at least two ways:

a. A report from one or more physicians or other knowledgeable persons that "several" current or recent cases of apparently the same disease have been observed and are thought--for one reason or another--to be related epidemiologically.

b. Routine individual morbidity reports may, upon careful review, reveal an apparent commonality in terms of the sex or age group of the cases, their place of residence or occupation, their surnames, or the time of the onset of their illness. The last mentioned factor--the time of onset of the illness--has proven to be an especially useful indicator of a possible common source outbreak. In the three examples which follow (Figures 4, 5, and 6), the reported cases of disease have been graphed according to the week or day of onset of the disease. The most important feature of these graphs relating to the detection of possible common source outbreaks is the sudden increase in the number of reported cases: within two time periods (weeks for hepatitis and days for salmonellosis) the number of reported cases increased several times over the usual number.

Figure 4

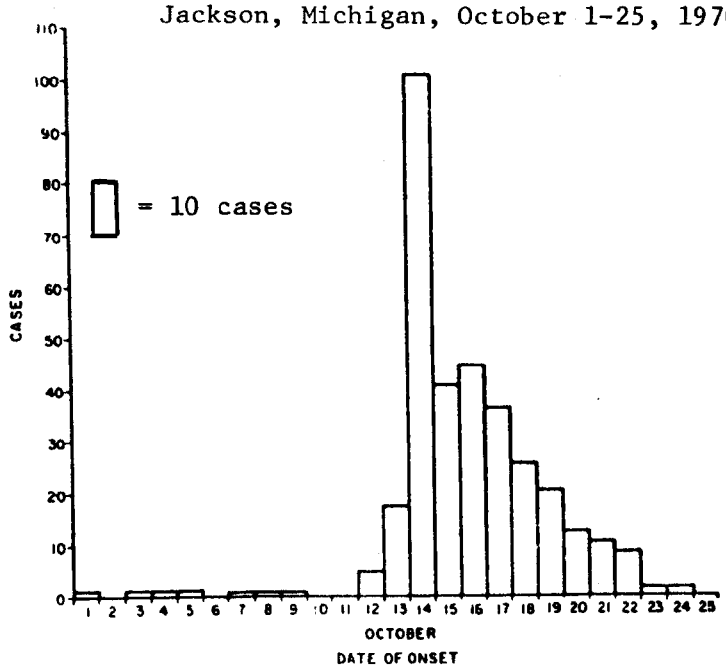
Cases of Hepatitis A, by Week of Onset, Polk County, Arkansas and Surrounding Areas, 1970



Source: Hepatitis Surveillance, HEW, PHS: Report No. 35, July 1972, p. 9.

Figure 5

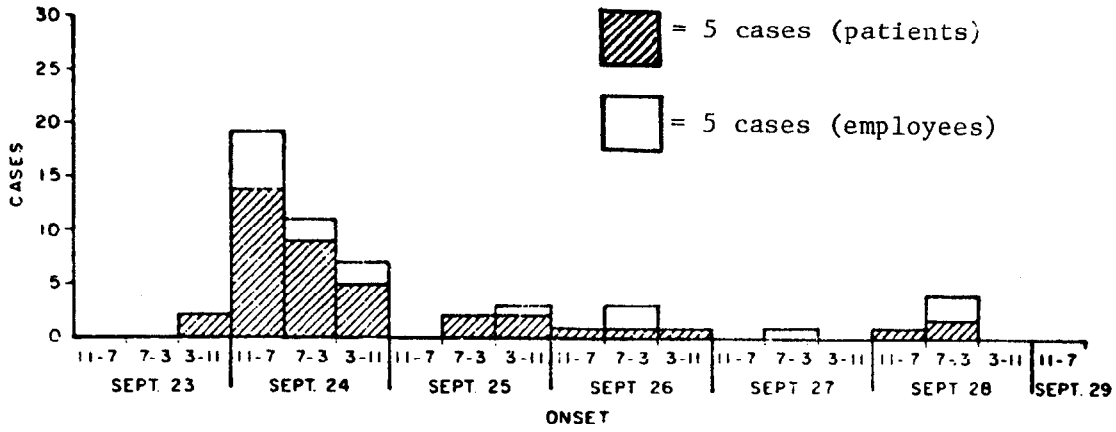
338 Cases of Gastrointestinal Illness, by Date of Onset, Jackson, Michigan, October 1-25, 1970



Source: Salmonella Surveillance, HEW, PHS, CDC: Report No. 103, October 1970, (Issued March 1971), p. 3.

Figure 6

Cases of Salmonellosis, By Date and Time of Onset, Pennsylvania Nursing Home, September 23-28, 1970



Source: Hepatitis Surveillance, HEW, PHS: Report No. 35, July 1972, p. 9.

4. IS THE INFECTION SEVERE (OR ACCOMPANIED BY AN UNUSUALLY HIGH FREQUENCY OF RESIDUAL EFFECTS) IN INDIVIDUALS OF SPECIAL HIGH RISK GROUPS?

In addition to those diseases routinely investigated (Table 2), good surveillance practice calls for the investigation of every case or suspected case of these diseases:

- -- shigellosis, salmonellosis, staphylococcal infection in newborn nurseries, day care centers, nursery schools, and nursing homes.
- -- hepatitis-B in hospital patients and staff.
- -- septicemias in patients receiving intravenous fluids.
- -- surgical wound infections.
- -- any infection in persons having a suppressed immunologic system.
- -- meningitis in children and in military or other training camps.

5. WOULD THE KNOWLEDGE OBTAINED FROM AN INVESTIGATION CONTRIBUTE TO A BETTER UNDERSTANDING OF THE DISEASE?

Significant gaps exist in the available knowledge of the epidemiology of many diseases. Furthermore, shifts from the known or customary patterns may occur at any time with respect to the host (e.g., risk of exposure, susceptibility); the agent (e.g., presence or absence, infectivity, pathogenicity); or the environment (changes in reservoirs or vectors, emergence of new vehicles).

If surveillance data suggest the possibility that investigation of selected cases of these diseases will yield new useful information and the necessary resources are available, then case investigations are appropriate.

6. ARE MEANS AVAILABLE FOR THE PREVENTION OR CONTROL OF THE DISEASE?

The decision not to investigate reported cases may be made on the basis of the nonavailability of preventive or control measures (which, of course, is not an argument against the continued surveillance of that disease). However, one should periodically review any existing policies that were established on the basis of the nonavailability of such measures since new knowledge and techniques are continually being developed to facilitate practical and effective disease control.

Your decision of whether or not to investigate should be based on your answers to the preceding questions. If the answer to question number 1 is yes--that is, the surveillance or disease control objectives require it--then an investigation is mandatory. If the answer to question 2, 3, or 4 is yes--that is, the infection is unusual in some way, a common source is suspected, or the infection is severe in individuals in special high risk groups--then an investigation would be appropriate provided that the answer to question 6 is yes--control measures are available. If the answer to question 5 is yes--the knowledge obtained might contribute to a better understanding of the disease--then an investigation may be appropriate even if the answer to each of the other questions is no.

If the answer to each of the six questions is no, then, in most instances, an investigation would not be warranted.

Analysis of Morbidity Reports

An intimate knowledge of the specific patterns of disease occurrence within the health organization's area of jurisdiction is required for the application of some of the investigative criteria discussed and for the identification of changes in the risk of acquiring various diseases over spans of time. This knowledge can be obtained only through a continuous, systematic process of consolidation and analysis of available surveillance data.

Consolidation of the data is achieved through collation and the subsequent preparation of tables, graphs, and charts which describe the occurrence of each disease with reference to time, place, and person. Figures 7 and 8 are examples of basic forms that might be used for tabulating surveillance data. The tabulated data can then be graphed or charted for easier identification of trends and epidemiologic associations among cases.

Figure 7

Suggested Form for the Tabulation of Each Reportable Disease:

By Week of Occurrence and Age Group of the Cases

Disease: _____

Age-Group in Cases (in years)	Number of Cases, by Week of Occurrence (or week of report)												
	1	2	3	4	Total	5	6	7	8	Total	etc	52	Total	Annual Total
Unknown														
0 - 4														
5 - 9														
10 - 14														
15 - 19														
20 - 24														
25 - 29														
30 - 34														
35 - 39														
40 - 44														
45 - 49														
50 - 54														
55 - 59														
60 - 64														
65 - 69														
70 - 74														
75+														
TOTAL														

Analysis of this data primarily involves making comparisons of the current data with some "normal" value, identifying differences between them, and assessing the significance of these differences.

While numbers alone are adequate in many instances, for optimal analysis this data must be converted to the appropriate rates, ratios, or proportions, using accepted mathematical techniques. The resulting figures provide a better measure of the occurrence of disease since they take into account the actual or approximate size of the population at risk.

Figure 8

Suggested Form for the Tabulation of Each Reportable Disease: By Week of Occurrence and Place of Residence of the Cases

Disease: _____

Census Tract (or school district township, county, etc.)	Number of Cases, by Week of Occurrence (or week of report)											
	1	2	3	4	Total	5	6	7	8	Total	etc	Total	Annual Total
1.													
2.													
3.													
4.													
5.													
6.													
7.													
8.													
9.													
10.													
11.													
12.													
TOTAL													

Many different kinds of comparisons can be made of reported cases of specified diseases and of reported laboratory isolates of specific etiologic agents. The comparisons might be only of gross numbers reported (e.g., measles in Isabella County), or, preferably, they might be of the number reported having specified characteristics--for example, the number of cases reported according to age group, sex, occupation, or area of residence. Data for the current reporting period can be compared to the corresponding figures for recent reporting periods; they can be compared to the corresponding period of previous years and to the current figures, both for larger areas of which the reporting area is a part and other areas.

For example, referring to Table 3, several different comparisons can be made and differences in occurrence identified. The difference from week-to-week in the number of cases in the less-than-15 year age group is negligible, as is the difference between the current and last year's 4-week total. The same is true of the age group 15-29, even though the weekly number of cases is higher in this age group than in the others. In the 30-plus age group, however, the report of eight cases during the fourth week of the year definitely represents a departure from the "norm" of the previous 3 weeks. There is a large difference, too, between this year's and last year's 4-week total in this age group for this period of time. If the criterion for investigation of this disease is an unusual incidence, then this situation merits investigation. The analyst should not simply examine figures in a "total" row or column, for two reasons: (1) they do not, by themselves, reveal whether the current incidence is normal or abnormal. This is established by comparing them to a norm of some kind. And (2) the totals do not reveal variations within the component groups of the total.

Table 3

Number of Cases of "X" Disease Reported to "M" County Health During the First Four Weeks of the Current and the Past Year

Age Group (years)	Number of Cases Reported, by Week of Report					
	Week				4-week Total	
	1	2	3	4	this year	same period last year
< 15	2	1	1	2	6	7
15 - 29	4	3	6	5	18	21
30+	1	0	1	8	11	2
TOTAL	7	4	8	15	35	30

Referring again to Table 3, if, instead of age groups in the left-most column, the names of three geographic areas were inserted, we would have a distribution of cases of disease "x" according to place within the county. The analysis of disease occurrence by place would be done exactly as previously described for analysis by age group.

Table 4 contains a summary of the various salmonella serotypes isolated at a county health laboratory and subsequently reported to the epidemiologist. These agents were recovered from stool specimens obtained from ill persons in the care of their physician.

Table 4

Salmonella Serotypes Isolated at the "A" County Public Health Laboratory from Specimens Obtained from Ill Persons, During The First Four Weeks of the Current and the Past Year

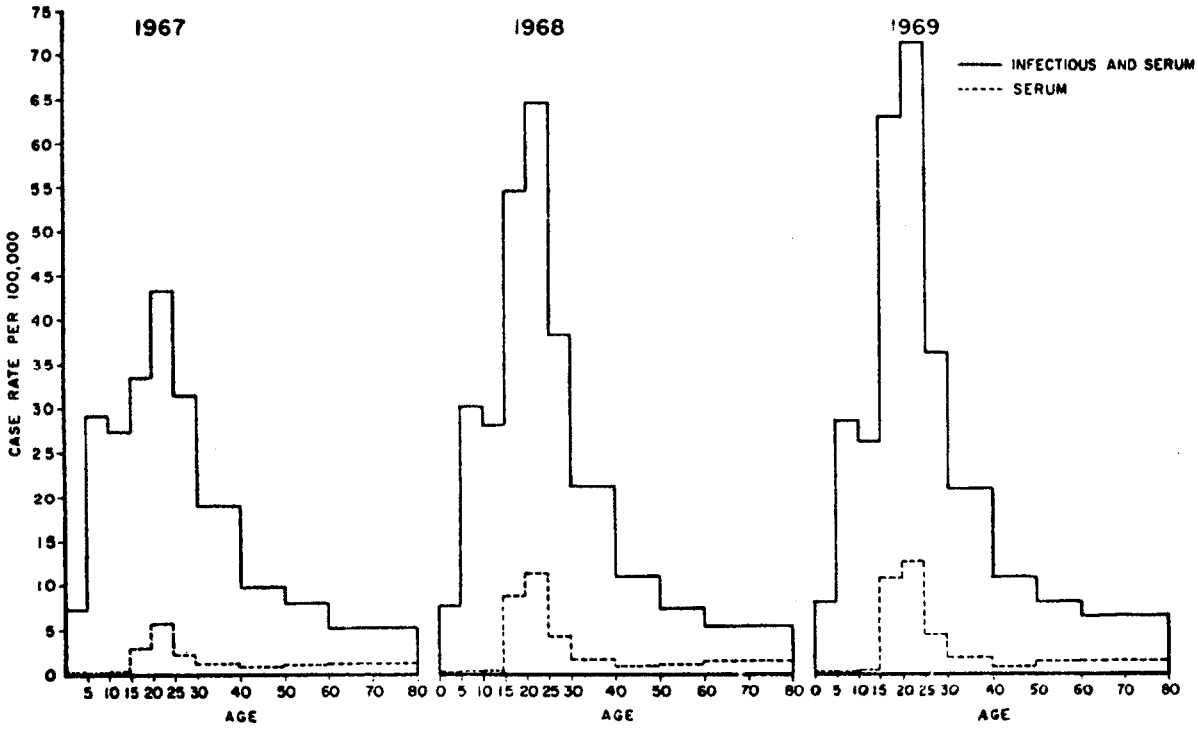
Serotype	Number of Isolates, by Week					
					4-Week Total	
	1	2	3	4	This year	Same Period Last Year
1. *typhimurium*	2	2	3	2	9	11
2. *enteritidis*	1	0	2	1	4	6
3. *infantis*	2	1	2	2	7	5
4. *heidelberg*	0	1	4	13	18	3
5. *newport*	1	0	2	1	4	3
6. *blockley*	2	1	1	1	5	3
7. *saint-paul*	1	0	0	1	2	2
8. *java*	0	0	0	0	0	1
9. others	3	4	2	4	13	15
TOTAL	12	9	16	25	62	49

Examining the number of reported isolates of each of the serotypes for the 4-week period shown, it can be seen that for most of the serotypes the weekly number of isolations and the range of fluctuation are relatively small. Similarly, the cumulative number of isolates of most of the serotypes are very much alike for both of the 4-week periods shown. The exception to these general patterns is the number of isolates of *S. heidelberg*. During weeks two, three, and four, this organism was isolated with increasing frequency. By the fourth week, it is clear that some unusual event is occurring which should be investigated. Even by the third week, however, the frequency of isolation had risen sufficiently so that the suspicion of the surveillance officer should have been aroused that something may be developing that merited close attention.

Turning to the question of identifying changes in risk over extended periods of time, it should be clear that detailed analyses of surveillance data for the period of concern is necessary. Figure 9 is an example of the outcome of the application of this process to national hepatitis surveillance data. The quoted passage which follows is the interpretation of the information in Figure 9. Not only have changes in incidence been noted but tentative explanations (hypotheses) of the cause of the changes have been offered. These are subject to verification through acquisition of additional information concerning the reported cases.

Figure 9

Cases of Viral Hepatitis per 100,000 Population, by Age Group and Type, United States, 1967, 1968, and 1969



Source (text and graph): Morbidity and Mortality Weekly Report, Annual Supplement: Summary 1969, HEW, PHS, CDC: Vol. 18, No. 54, September 1970.

Increased hepatitis incidence has been noted over the last three years. The most intriguing aspect is the changing pattern in the age distribution of attack rates. Although attack rates of hepatitis reported as infectious (hepatitis-A) are usually about the same for the 5-9, 10-14, 15-19, and 20-24 age groups, there has been a marked increase only in the 15-19 and 20-24 age groups over the last 2 years. Reported cases rates of serum hepatitis (hepatitis-B) have increased in each 5-year age group between the ages of 10 and 39 but the greatest rise has been observed in the 15-19 group, with the 20-24 group following closely. The rate of increase in serum hepatitis (hepatitis-B) incidence in these age groups is much greater than the rate of increase in infectious hepatitis (hepatitis-A). Additional data, not shown here, indicate that the rate is higher among young males than females. These data at least lend credence to the suggestion that increased hepatitis incidence is due in part to the unsanitary aspects of parenteral drug usage.

There are two qualitative aspects of disease surveillance which have a direct bearing on, and must be considered in, the analysis and interpretation of collected data. These are the accuracy and sensitivity of that data. "Accuracy" refers to the correctness of the reported data and "sensitivity" refers to the degree to which the system measures the true incidence. It is the latter that is adversely affected by delayed and incomplete reports. Both accuracy and sensitivity are measureable: accuracy by doing case investigations, and sensitivity by doing prevalence surveys. The degree to which the accuracy and sensitivity of the data remain the same over extended periods of time or are similar in different places determines the comparability of the surveillance data from one place over time or from different places during the same period of time.

The comparability of surveillance data must be maintained if the important epidemiologic indices and trends are to be identified and used. It could be jeoparadized through changes in the:

1. Relative contributions of the various sources of data (e.g., physicians, hospitals, and schools) to the system.
2. Level of emphasis on active case detection (e.g., case investigation and screening programs).
3. Diagnostic criteria of the reportable diseases.

If any of these changes occur, provision should be made for an overlap of the old and new ways for a period of several years so that the comparability of the data can be established.

SPECIAL SURVEILLANCE ACTIVITIES

"Special," as used here, refers to any surveillance activity that is supplemental to, but not dependent upon, a morbidity report being made to the health agency by a physician or other knowledgeable individual as required by the State's morbidity reporting regulations. The primary purpose of these special surveillance activities is to monitor the potential for human disease.

Depending upon the health department's objectives, special surveillance activities may be conducted continuously or intermittently over a period of years (primarily to obtain a more complete description of disease patterns and to monitor the potential for human diseases) or may be periodic and limited in duration to a known or suspected epidemic period (to assess the extent and progress of the disease). These surveillance activities may consist of functions performed solely by health department employees or they may require the active cooperation of other knowledgeable persons outside of the health department.

For discussion purposes, special surveillance activities are presented in three broad groups. The first group is composed of those activities whose focus is the human population; the second is those whose focus is animal population; and the third is those whose focus is on some part of the inanimate environment.

Human Populations

Those activities focused on human populations are intended:

1. to assess the susceptibility of specific populations and subpopulations to various diseases, especially those which may be prevented by vaccines;
2. to detect the occurrence of infection, including inapparent infections (subclinical cases).

Population susceptibility can be assessed in several ways: through community serological or interview surveys and through the analysis of health department and institutional (schools, etc.) records of immunizations. Each method has associated with it certain advantages and disadvantages in terms of the populations for which the data can be obtained, the limitations and reliability of the data obtained, and the difficulty and cost of getting it.

For example, serological and interview surveys can be conducted on a sample of all or any part of the population of a community, while the data obtained from the analysis of health department and school immunization records are restricted to those parts of the population (economic or age groups) actually served by these organizations. The difficulty and cost of getting data is greatest for the serological and interview surveys and least for the analysis of immunization records. Offsetting their low cost and ease of acquisition, however, is the fact that (1) all records are historical and, therefore, indicate a past condition rather than a current one, (2) the health department's service population is difficult to define precisely, and that population is not served exclusively by the health department (immunizations may have been obtained elsewhere); and (3) some schools may not maintain records of the immunization status of their students.

There are several ways in which the second purpose of special surveillance of human population (to detect the occurrence of infection, including inapparent infection) is achieved. These include:

1. The review of reports and records, including death certificates, disease registers, hospital records, laboratory reports, reports of absenteeism in schools and industries, and animal bite reports; and,
2. The conduct of special surveys, including serologic and culture surveys in which enteric, nasopharyngeal, or genitourinary specimens are obtained from selected populations; and tuberculin and other skin-testing surveys.

Animal Populations

Epidemiologic studies or surveillance activities which focus on animal populations are most often concerned with detecting and measuring one or more of the following: (1) morbidity and mortality that is caused by a disease which can affect man (zoonoses); (2) the presence of a disease agent in wild and domestic sentinel animals; and (3) increases and decreases in the size of the population of animal reservoirs and vectors of disease.

Among the more important zoonoses contributing to morbidity and mortality in wild and domestic animals in the United States, and the number of human cases of each which were reported to the Center for Disease Control in 1974, are anthrax (2), botulism (28), brucellosis (240), echinococcosis (18, but is not nationally reportable), infectious encephalitis (1,967; known vectorborne, 88), leptospirosis (68), plague (8), psittacosis (164), Q-fever, 57 (but is not nationally reportable), rabies (0), Rocky Mountain spotted fever (754), salmonellosis (21,980), trichinosis (120), and tularemia (144).

The degree to which surveillance is applied to these diseases is usually dependent on the relative importance locally of the various diseases as judged by the severity and frequency with which the disease can or does affect man. The kind of surveillance data collected, the source, and the method of obtaining it are dependent on the intensity of the problem and the local natural history of the disease. The analysis of surveillance data for animal diseases requires the same caution as for human diseases since they share some of the same problems for reporting (recognition or suspicion of the disease by veterinary practitioners, accessibility and utilization of laboratory services). Furthermore, the reporting of some animal diseases, including rabies, may reflect the distribution of the human population better than it does the distribution of the disease in animals or of the focus of the problem in nature.

In addition to collecting surveillance data on ill animals, it is desirable in some instances to collect data which reflect the prevalence of the disease agent in apparently healthy wild and domestic animals. This is done by periodically conducting serologic and parasite surveys of the animals of concern and of the appropriate disease vectors (if the disease is vectorborne). The purpose of the serological surveys is to determine the proportion of animals which have experienced recent or past infection; the purpose of the parasite studies is to identify changes in the proportion of the population that currently harbors the causative agent; and the purposes of the vector studies are to identify changes in the size and distribution of the vector population and of the prevalence of the etiologic agent in the vector population. This information provides an index of the risk to man of acquiring the disease.

Two examples of the application of these techniques are arthropodborne viral encephalitis and plague. Encephalitis surveillance can include both serologic surveys of selected animal populations (horses, deer, etc., depending on the specific etiologic agent of interest) and surveys to determine the size and distribution of the appropriate mosquito population(s) and the prevalence of the virus in that population. Plague surveillance can

include serologic surveys of selected genera of rodents, and of domestic dogs, which dwell in known or suspected plague-infected areas; and it can, and should, include attempts to recover the etiologic agent from fleas combed from the animals which were trapped and bled.

Environmental Factors

Routine environmental surveillance activities most commonly are intended to detect contamination of public water, milk, and food supplies. Under special circumstances (e.g., a disease outbreak), surveillance may be instituted over the food or air in, or from selected sources. Another focus of environmental surveillance activities is the conditions in nature which are conducive to the propagation or maintenance of various animal populations which may be reservoirs or vectors of disease.

HEALTH DEPARTMENT SURVEILLANCE REPORTS

Surveillance reports are intended to serve the purpose of providing current epidemiologic information to the various users of this information. These reports are directed primarily to the members of two distinct groups: public health officials and private physicians. In the United States, these reports are prepared by many local health departments, all state health departments, and the Public Health Service. The World Health Organization also prepares a surveillance report which contains information relevant to the United States. Most state and local health departments prepare them on a weekly or monthly basis, while the PHS and the WHO prepare them on a weekly basis.

The contents of the reports issued at all but local levels have at least one feature in common: the number of case reports received during the current reporting period (week or month) are listed, by disease, for the entire reporting area and for the political subdivisions within that area. Frequently shown, too, are the number of cases reported during the previous reporting period, the cumulative number of cases of each disease that have been reported since the beginning of the year, the number that had occurred during the same period of the preceding year (both the cumulative number and the number which occurred during the same week or month), and the median number reported for the same period during the past 5 years.

Not infrequently, the report is used as a vehicle for disseminating to the private and public health community: (1) information of current interest regarding the prevention, diagnosis, and treatment of selected diseases and (2) summaries of epidemiologic investigations in progress or recently completed.

At the national level, the CDC's "Morbidity and Mortality Weekly Report" is augmented by a wide variety of surveillance reports issued at varying intervals for a number of specific diseases or groups of related diseases (See Appendix C). These reports are based not only on numbers of cases

reported by the states, but on the more detailed case investigation forms contributed by the state's investigators, reported laboratory isolations, and special studies and surveys (including investigations involving CDC).

As with any type of report predicated on data collected in a given time period, surveillance reports run the risk of not being timely--either because of an excessively long reporting period or because of delays in the preparation or distribution of the reports. A lack of timeliness and deficiencies in the content or format of the report commonly are the leading reasons for reports not being read. This means that producers of reports must strive to be timely and to produce attractive, well written reports people will want to read.

APPENDIX

APPENDIX A

DISEASE SURVEILLANCE TASKS

The specific tasks which may be performed in the conduct of disease surveillance include the following:

A. Establish objectives of disease surveillance system and determine data needed.

B. Collect data.

1. Collect and review data from:

a. Disease case reports.
b. Laboratory reports (public and private).
c. Case and contact investigations.
d. Death certificates.
e. Maintain contacts with and receive reports from schools, industry, and health care facilities.
f. Other sources.

2. Perform case investigations.

C. Organize data.

1. Identify criteria for grouping data by time, place, and person.
2. Calculate rates, ratios, and proportions.
3. Prepara tables, graphs, and charts.

D. Analyze and interpret data.

1. Identify high-risk groups in terms of time, place and person.
2. Interpret your data to identify similarities and differences in levels of disease transmission.

a. Compare present analysis of surveillance data with:

(1) Past analyses.
(2) State-wide analyses.
(3) National analyses (CDC Surveillance Reports)

b. Utilize data available from previous epidemic investigation and other studies.

(1) Animal reservoirs - vectors.
(2) Biologics utilization: vaccines, blood, and blood products.
(3) Utilization of chemicals: drugs, pesticides, etc.
(4) Utilization of preventive measures: immunization levels, etc.
(5) Screening programs: skin test reactors, serologic culture, x-ray, etc.

c. Utilize data available from national, state, and local sources.

(1) Demographic studies.
(2) Environmental studies.
(3) Studies relating to specific etiologic agents.

3. Identify factors potentially relating to disease transmission.
4. Select the factors most probably responsible.

E. Formulate hypothesis concerning factors affecting disease transmission using the analyses and interpretations above.

F. Test the hypothesis.

1. Identify data needed
2. Obtain the data needed.
3. Organize the data.
4. Analyze and interpret data.
5. Conclude that the hypothesis is either true or false, and if false, form a new hypothesis (see D.4.).

G. Recommend and/or implement control measures.

1. Establish objectives for control.
2. Recommend measures for achieving objectives
3. Implement control measures.
4. Assess control measures.

H. Prepare and distribute reports of data to all persons, agencies, etc., disease control programs; include interpretations, projections of trends, and relevant recommendations for control.

I. Assess surveillance system.

1. Assess surveillance data: accuracy, completeness, timeliness.
2. Assess utilization and relevance of data.
3. Determine if surveillance objectives are being met.
4. Develop and implement recommendations.

Appendix B

CONFIDENTIAL DISEASE CASE REPORT

CDC 4.2430
REV. 5-75

CONFIDENTIAL DISEASE CASE REPORT

DISEASE		DATE OF REPORT	DATE OF ONSET	
PATIENT'S NAME		AGE	SEX	RACE
ADDRESS	STREET NO. (R. F. D. if rural)		APT. NO.	
	CITY OR COUNTY			
NAME OF HEAD OF HOUSEHOLD				
REMARKS				
NAME OF REPORTING PHYSICIAN, HOSPITAL, OR OTHER AUTHORIZED PERSON				
OFFICE ADDRESS				

Use CDC 5.2431 for TB Reports.
Use CDC 9.94 for VD Reports.

☐ Check here if additional cards are needed.

Actual Size

Source: *Manual of Procedures for National Morbidity Reporting and Public Health Surveillance Activities (Effective November 1978), HEW, PHS, CDC, Atlanta, Georgia, p. VII.9.*

APPENDIX C

MORBIDITY SURVEILLANCE REPORTS PREPARED AND DISTRIBUTED BY THE CENTER FOR DISEASE CONTROL

CDC Surveillance Reports

1. Abortion Surveillance
2. Brucellosis Surveillance
3. Congenital Malformations Surveillance
4. Diphtheria Surveillance
5. Family Planning Services
6. Foodborne and Waterborne Disease Outbreaks
7. Hepatitis Surveillance
8. Influenza-Respiratory Disease Surveillance
9. Leprosy Surveillance
10. Leptospirosis Surveillance
12. Malaria Surveillance
13. Measles Surveillance
14. Morbidity and Mortality Weekly Report
15. Mumps Surveillance
16. National Nosocomial Infections Study
17. Neurotropic Diseases Surveillance
    a. Aseptic meningitis
    b. Encephalitis
    c. Poliomyelitis
18. Nutrition Surveillance
19. Primate Zoonoses Surveillance
20. Psittacosis-Zoonosis Surveillance
21. Rabies-Zoonosis Surveillance
22. Reported Tuberculosis Data
23. Rh Hemolytic Disease Surveillance
24. Rubella Surveillance
25. Salmonella Surveillance
26. Shigella Surveillance
27. Tetanus Surveillance
28. Trichinosis Surveillance
29. United States Immunization Survey
30. Venezuelan Equine Encephalitis-Zoonosis Surveillance
31. Veterinary Public Health Notes

EXERCISES FOR DISEASE SURVEILLANCE

EXERCISES FOR DISEASE SURVEILLANCE

When you have read the reference, "Principles of Epidemiology: Disease Surveillance", answer the questions which follow for each exercise.

For purposes of interpreting the tables presented, consider all information as having been collected from a population served by a single health jurisdiction. During the periods identified, the population within the area has not changed with respect to size or other characteristics. In light of these conditions the number of reported cases tabulated by week of onset would reflect the relative risk of acquiring disease by the population at large.

Within this same health jurisdiction one of the criteria for investigating reported cases of a disease is an increase greater than twice the normal incidence of that disease during any weekly interval. The normal incidence which is used for purposes of comparison is the average incidence during the comparable period for the preceding year. Reported cases for the current periods presented, as well as, the comparable period for the preceding year are distributed by week of onset of illness.

After having made your selections, you may compare your answers with those given on pages 44 and 45.

Exercise A

(Consists of Questions 1 through 4)

GIVEN: The distribution of reported cases of measles by township and week of onset of illness and the average number of cases for the comparable period of the preceding year.

TOWNSHIP	NUMBER OF CASES, BY WEEK OF ONSET								AVERAGE #/WEEK FOR SAME 8 WEEKS LAST YEAR
	1	2	3	4	5	6	7	8	
1. Green	1	0	2	4	6	7	3	1	1
2. Peach	0	1	0	0	3	4	5	1	1
3. Harvey	1	2	1	3	2	2	1	3	2
4. Lake	7	5	6	8	7	4	4	7	6
5. Anvil	2	1	5	3	4	2	4	2	3
TOTAL	11	9	14	18	22	19	17	14	12

1. In which of the following weeks is the number of cases greater than twice the normal incidence?

   A. Weeks 4 & 5
   B. Weeks 4, 5, 6 & 7
   C. Weeks 5, 6 & 7
   D. Weeks 2, 3, 4 & 5
   E. None

2. Townships meeting the criteria for case investigations are:

   A. Lake and Anvil
   B. Green, Peach and Anvil
   C. Green and Peach
   D. Green, Peach, Lake and Anvil
   E. None; there is no problem

3. Knowing that the five townships comprise a single county, the earliest week at which a possible problem can be identified within this county is:

   A. Week 1
   B. Week 2
   C. Week 3
   D. Week 4
   E. None; there is no problem

4. Had health department personnel ignored the distribution of cases by township and reviewed only the weekly totals, which of the weeks would have met the criterion for case investigations?

   A. Week 4
   B. Week 5
   C. Weeks 4 & 5
   D. Weeks 3, 4, 5, 6, 7 & 8
   E. None

Exercise B

(Consists of Questions 1 through 5)

GIVEN: The distribution of cases of measles reported to the county health department by age group and week of onset of illness and the average number of cases for the comparable period of the preceding year.

AGE GROUP (YEARS)	NUMBER OF CASES BY WEEK OF ONSET								AVERAGE #/WEEK FOR SAME 8 WEEKS LAST YEAR
	1	2	3	4	5	6	7	8	
< 1	0	2	2	0	0	2	1	0	1
1 - 4	3	9	10	14	12	17	11	5	4
5 - 9	0	1	1	7	8	2	4	1	3
10 - 19	0	3	4	2	0	1	1	2	2
20+	0	0	0	0	1	0	0	0	1
TOTAL	3	15	17	23	21	22	17	8	10

1. Without considering the distribution of cases by age group and considering only the weekly totals, during which of the following weeks would the number of cases warrant case investigations?

   A. Weeks 4 & 6
   B. Weeks 4, 5 & 6
   C. Weeks 3, 4, 5, 6 & 7
   D. Weeks 2, 3, 4, 5, 6 & 7
   E. None

2. Without considering the weekly totals and considering only the weekly distribution of cases by age groups, which weeks have sufficient cases to warrant case investigations?

   A. Week 3
   B. Weeks 4, 5 & 6
   C. Weeks 2, 3 & 6
   D. Weeks 2, 3, 4, 5, 6 & 7
   E. Weeks 4, 5, 6 & 7

3. The earliest week during which a potential problem can be identified necessitating case investigations is:

   A. Week 2
   B. Week 3
   C. Week 4
   D. Week 5
   E. Week 6

4. Considering the analysis of weekly totals (Part A) and the subsequent analysis of cases occurring within the age groups (Part B), which of the following statements is correct?

   A. Weekly totals alone were sufficient to identify weeks during which case investigations were necessary.
   B. The largest number of excess cases occurred in week 4 and was apparent in reviewing the total cases and individual age groups.
   C. The review of cases occurring by individual age groups indicated a need for case investigations two weeks prior to that indicated by reviewing only weekly totals.
   D. Items "B" and "C"
   E. None of the above

5. The age group primarily responsible for cases exceeding the normal incidence is:

   A. Under 1 year
   B. 1 - 4
   C. 5 - 9
   D. 10 - 19
   E. 20+

Exercise C

(Consists of Questions 1 through 4)

GIVEN: Reported cases of hepatitis-A received by the county health department tabulated by township and week of onset of illness. The normal incidence for this period is given as the average number of cases per week for the same eight weeks of the preceding year.

TOWNSHIP	NUMBER OF CASES BY WEEK OF ONSET								AVERAGE #/WEEK FOR SAME 8 WEEKS LAST YEAR
	1	2	3	4	5	6	7	8	
Green	1	0	2	0	1	1	2	0	1
Peach	0	1	0	0	3	4	6	8	1
Harvey	7	6	4	3	2	2	1	1	2
Lake	4	3	0	4	3	2	4	1	3
Anvil	2	8	12	17	7	2	4	0	2
TOTAL	14	18	18	24	16	11	17	10	8

1. Excluding the distribution of cases by townships and considering only the weekly totals, in which of the weeks would excess cases meet the criterion for case investigations?

   A. Week 4
   B. Weeks 2, 3 & 4
   C. Weeks 2, 3, 4 & 5
   D. Weeks 2, 3, 4, 5 & 7
   E. Weeks 2, 3, 4 & 7

1. Without considering the distribution of cases by age group and considering only the weekly totals, during which of the following weeks would the number of cases warrant case investigations?

   A. Weeks 4 & 6
   B. Weeks 4, 5 & 6
   C. Weeks 3, 4, 5, 6 & 7
   D. Weeks 2, 3, 4, 5, 6 & 7
   E. None

2. Without considering the weekly totals and considering only the weekly distribution of cases by age groups, which weeks have sufficient cases to warrant case investigations?

   A. Week 3
   B. Weeks 4, 5 & 6
   C. Weeks 2, 3 & 6
   D. Weeks 2, 3, 4, 5, 6 & 7
   E. Weeks 4, 5, 6 & 7

3. The earliest week during which a potential problem can be identified necessitating case investigations is:

   A. Week 2
   B. Week 3
   C. Week 4
   D. Week 5
   E. Week 6

4. Considering the analysis of weekly totals (Part A) and the subsequent analysis of cases occurring within the age groups (Part B), which of the following statements is correct?

   A. Weekly totals alone were sufficient to identify weeks during which case investigations were necessary.
   B. The largest number of excess cases occurred in week 4 and was apparent in reviewing the total cases and individual age groups.
   C. The review of cases occurring by individual age groups indicated a need for case investigations two weeks prior to that indicated by reviewing only weekly totals.
   D. Items "B" and "C"
   E. None of the above

5. The age group primarily responsible for cases exceeding the normal incidence is:

   A. Under 1 year
   B. 1 - 4
   C. 5 - 9
   D. 10 - 19
   E. 20+

Exercise C

(Consists of Questions 1 through 4)

GIVEN: Reported cases of hepatitis-A received by the county health department tabulated by township and week of onset of illness. The normal incidence for this period is given as the average number of cases per week for the same eight weeks of the preceding year.

TOWNSHIP	NUMBER OF CASES BY WEEK OF ONSET								AVERAGE #/WEEK FOR SAME 8 WEEKS LAST YEAR
	1	2	3	4	5	6	7	8	
Green	1	0	2	0	1	1	2	0	1
Peach	0	1	0	0	3	4	6	8	1
Harvey	7	6	4	3	2	2	1	1	2
Lake	4	3	0	4	3	2	4	1	3
Anvil	2	8	12	17	7	2	4	0	2
TOTAL	14	18	18	24	16	11	17	10	8

1. Excluding the distribution of cases by townships and considering only the weekly totals, in which of the weeks would excess cases meet the criterion for case investigations?

   A. Week 4
   B. Weeks 2, 3 & 4
   C. Weeks 2, 3, 4 & 5
   D. Weeks 2, 3, 4, 5 & 7
   E. Weeks 2, 3, 4 & 7

2. Considering only the distribution of cases by week of onset and township (excluding weekly totals), case investigations would be indicated in which of the following weeks on the basis of excess cases?

   A. All weeks
   B. Weeks 2, 3 & 4
   C. Weeks 2, 3, 4 & 7
   D. Weeks 1, 2, 3, 4, 5 & 7
   E. Weeks 1, 2, 3, 4, 5, 7 & 8

3. On the basis of excess cases, case investigations would be required in which of the following townships?

   A. Harvey and Anvil
   B. Peach and Anvil
   C. Harvey, Peach and Anvil
   D. All except Lake
   E. All of the townships

4. The ratio of weeks identified in Part 2 (cases by week and township) to weeks identified in Part 1 (total cases by week) requiring case investigations is:

   A. 1:1
   B. 1:2
   C. 1:3
   D. 2:1
   E. 3:1

Exercise D

(Consists of Questions 1 through 4)

GIVEN: Reported cases of hepatitis-A received by the county health department tabulated by age and week of onset along with the average number of cases per week for the same eight week period of the preceding year.

AGE GROUP (Years)	NUMBER OF CASES BY WEEK OF ONSET								AVERAGE #/WEEK FOR SAME 8 WEEKS LAST YEAR
	1	2	3	4	5	6	7	8	
< 15	0	2	2	0	0	2	1	0	1
15 - 29	7	8	10	7	9	8	9	7	3
30+	2	1	0	3	2	1	1	2	2
TOTAL	9	11	12	10	11	11	11	9	6

1. Excluding the distribution of cases by age group and considering only the weekly totals, in which of the weeks would excess cases meet the criterion for case investigations?

   A. Week 3
   B. Weeks 2, 3, 4, 6 & 7
   C. Weeks 2, 3, 4, 5, 6 & 7
   D. All of the weeks
   E. None of the weeks

2. Considering only the distribution of cases by week of onset and age group, case investigations would be indicated in which of the following weeks on the basis of excess cases?

   A. Week 3
   B. Weeks 3, 5 & 7
   C. Weeks 2, 3, 5, 6 & 7
   D. All of the weeks
   E. None of the weeks

Exercise E

GIVEN: Reported cases of a disease received by a county health department by week of onset of illness during a period of eight weeks.

WEEK	1	2	3	4	5	6	7	8
NO. CASES	7	6	9	5	4	5	8	7

In light of the data presented, what additional information is needed in order to arrive at a conclusion that an epidemic did not occur at some time during the period of eight weeks?

Exercise F

GIVEN: The distribution of cases by age group and sex obtained from a report of an epidemic of salmonellosis which occurred in a mental hospital over a period of one week.

AGE GROUP	MALE	FEMALE	TOTAL
60 - 64	5	8	13
65 - 69	13	19	32
70 - 74	15	23	38
75 - 79	4	6	10
80 - 84	2	4	6
85 - 89	2	3	5
TOTAL	41	63	104

After reviewing the distribution of cases, which of the following statements concerning the risk of disease acquisition is true?

A. Females have a higher risk than males.
B. The 65-69 and 70-74 age groups have a higher risk compared with other age groups.
C. The 70-74 age group has the highest risk.
D. All of the above statements are correct.
E. No statement of risk can be made.

ANSWERS TO DISEASE SURVEILLANCE EXERCISES

ANSWERS TO DISEASE SURVEILLANCE EXERCISES

Exercise A

Question 1 - B
Question 2 - C
Question 3 - D
Question 4 - E

Exercise B

Question 1 - B
Question 2 - D
Question 3 - A
Question 4 - C
Question 5 - B

Exercise C

Question 1 - E
Question 2 - A
Question 3 - C
Question 4 - D

Exercise D

Question 1 - E
Question 2 - D

Exercise E

The distribution of cases by place, and person for the cases presented as well as comparable data for preceding intervals of time.

Exercise F

"E" is the correct answer.

No statement of risk can be made in the absence of knowledge of the populations for each of the age and sex groups from which the cases came. If the populations in each of the age and sex groups were essentially the same, then "D" would have been an acceptable answer.

The populations, cases, and attack rates are given in the following table.

Age Group	Male			Female			Total		
	Pop.	No. Cases	A.R. (%)	Pop.	No. Cases	A.R. (%)	Pop.	No. Cases	A.R. (%)
60 - 64	84	5	6.0	121	8	6.6	205	13	6.3
65 - 69	76	13	17.1	93	19	20.4	169	32	18.9
70 - 74	32	15	46.9	88	23	26.1	120	38	31.7
75 - 79	8	4	50.0	14	6	42.9	22	10	45.5
80 - 84	4	2	50.0	8	4	50.0	12	6	50.0
85 - 89	4	2	50.0	6	3	50.0	10	5	50.0
TOTAL	208	41	19.7	330	63	19.1	538	104	19.3

In comparing the attack rates for total males (19.7) and females (19.1), it becomes apparent that no differences exist in risk of disease acquisition between these two groups. In comparing the attack rates for males and females in each age group, it would seem that there are no differences in risk with the possible exception of the age group 70-74 where males appear to have a higher risk than females (this difference is not statistically significant). In comparing the attack rates for the total populations in each age group, the risk of disease acquisition rises steadily through the first three age groups and remains essentially the same in the last three age groups.

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